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TWENTY-FIFTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE ACADEMIC YEAR, 1948-49

Students. The numbers of students reading at the Institute again showed an increase. This was the last year it had been possible to admit students under the special arrangements made for ex-Service candidates, and in future all students will be required to have attained honours in Honour Moderations in Natural Science, or in a Final Honour School. Eighteen students were successful in the Final Examination, five gaining Second Class Honours, ten Third Class Honours and three Fourth Class Honours. Seven have obtained appointments in the Colonial Forest Service and one (Mr. D. S. Jackson) is going to New Zealand.

There was only one graduate Colonial Forestry Scholar (from Oxford University) and he has now been posted to Uganda for his apprentice tour.

The Colonial Forest Officers' course was attended by 11 Officers and Probationers from the Gold Coast (5), Malaya (3), Nigeria (1), Northern Rhodesia (1), and Sierra Leone (1).

The special course arranged for Forest Officers from India and Pakistan was attended by only one officer from India and one from Pakistan. It had been decided that it would be of more help to the officers if the course were extended from a two-term into a three-term course, and this change was introduced this year. Actually, both men have stayed on through the Long Vacation on research work and one has undertaken a tour in the U.S.A., mainly to study soil conservation work. This further extension makes it possible for them to qualify as candidates for the post-graduate Diploma of Forestry.

Research Students. Both the officer from India and the officer from Pakistan were admitted as candidates for the Diploma in Forestry. Their subjects were:—

(1) Studies of the Differential Toxicity of Herbicides to Tree Species.

(2) Study of cytogenetics in certain *Larix, Acacia* and *Prosopis* species.

One student (Mr. K. C. Sahni) was awarded a B.Sc. on a thesis on 'Larch canker fungus: its pathogenic role and variation.'

Colonial Service Courses. The Professor gave the special course on Colonial Forestry to the Colonial Civil Service Cadets at Oxford and also at Cambridge, and conducted seminars in Land Utilisation subjects at the former place.

Student Tours. During the Easter Vacation twenty-four of the junior year students made the usual tour in Normandy and the Landes, and during the Long Vacation the senior year (twenty) visited Norway and Sweden. The Forest Officers and Probationers visited Belgium, the Jura and Vosges and then crossed into Switzerland. In all five countries most generous help was again received from the Forest Services, from individual forest officers and from others whose forests were visited: we also again had the valuable help of M. Hubault in connection with the French tours and that of Dr. Romell for part of the Swedish tour. A tour for Colonial Forest Officers and others during Easter Vacation included the experimental areas of the Forestry Commission in Central Scotland and Yorkshire, and woods on the Bowmont and Kylo (Northumberland) estates of the Duke of Roxburgh and Major Mitchell respectively.

Working Plans. The senior year completed their Working Plans in the High Meadow Woods, Gloucester, during Easter Vacation. This year the junior year commenced their Working Plan in September, in the New Forest. They were accommodated at *Northerwood House,* and much appreciated the facilities now provided there.

Utilisation Course. The ten-day Utilisation Course at the Forest Products Research Laboratory, at Princes Risborough, was arranged again during the Christmas Vacation. As in previous years, the Institute is greatly indebted to the Director and his staff for the facilities and help given in connection with this course and with other requests arising from the needs of individual students studying Utilisation subjects.

Vacations: Practical Work. Students continue to follow the advice given them to get practical experience of forestry during vacations and every help is given in finding suitable employment. Practical work was arranged with the Forestry Commission for ten men in South Wales and the New Forest. Seven others worked on private estates in England. Four students worked in the forests and sawmills in Norway on the invitation of the owners. Practical work of this kind is invaluable to our students. They work for the same hours and for the same wages as the woodmen, and it brings them into direct contact with foresters and foremen in the woods.

Excursions. The following day excursions were made with senior students during the summer term: Messrs. Howard's Sawmills, Southampton; Imperial Institute, London; Boughton Estate, Northamptonshire; Messrs. Gliksten & Sons' Sawmills, Stratford, London; Forestry Commission, Bramshill; Mr. F. E. Workman's woods at Ebsworth and Popeswood (Glos.); Elstree Studios (Aerial Survey); furniture industries and sawmills at High Wycombe.

The junior year visited local woods mainly to study soil and silvicultural problems. The places selected were Wytham Woods, Bagley Wood, Hampden Woods, Wokingham and Kingsclere.

Our thanks are tendered to all who kindly gave facilities for these useful visits.

Discussions. Weekly discussions of forestry topics of wide interest have been arranged for those attending advanced courses, the large majority having had several years of practical experience. Those taking part chose the subjects and each in turn presided over the discussion on one occasion and acted as secretary on another. This practice gives all students some useful experience in conducting such discussions with the help of guidance from the staff, and results in a sharing of the knowledge acquired in a number of different territories, a good deal of it not available from literature. The senior undergraduate students have a parallel series of meetings of a different type at which each in turn presents in a brief paper the results of his study of some aspect of forestry, usually a topic on which he is working as his 'special subject' for the Final Honour School. After reading his paper the student has to answer questions which are definitely directed mainly at the accuracy of his statements and the validity of his deductions. Here again, the staff find that the method serves several useful purposes.

Tuition. Tutorial arrangements remained unchanged but a heavy burden was thrown on the staff by the large number of students. This is liable to be still further increased in the coming year by the exceptional size of the final year class (thirty-two) all requiring supervision in their special subject work as well as normal tuition: this will be only partly offset by the marked sudden drop (to about a dozen) expected in the new junior year.

Library, etc. The report given later shows that the demand on the library facilities continues to grow, and that work on the essential catalogues continues to be heavy. Co-operation with the Commonwealth Forestry Bureau remains close and runs smoothly. The subject of the classification system for forestry information was again discussed by the Bibliographical Committee of the International Union of Forest Research Organisations at the World Forestry Congress at Helsingfors, and matters advanced sufficiently for our desired changes to be introduced in 1950.

Wytham Woods. A more detailed report is given below but it may be noted that Dr. Anderson has been able to complete a draft Working Plan for consideration by the University. Planting has continued on the land taken up for war time food production, 50.7 acres having been dealt with. The woods continue to be used extensively for biological studies and instructional purposes.

Bagley Wood. Dr. Anderson has begun the field work which will lead to the preparation of a Working Plan for the wood in a form suitable for the authorities concerned with 'dedication,' which step St. John's College has expressed its readiness to consider.

Staff Tours. Together with Mr. W. E. Hiley, Manager of the Woodlands Research Department of Dartington Hall, the Professor made a visit to the Western States of the U.S.A. and to British Columbia to study developments in the forests during the war period, as reported in the 1947/48 Annual Report. During the first three months of 1949 he also made an extended tour of Nigeria, the Gold Coast and Sierra Leone.

Mr. F. White, who succeeded Mr. Brenan as Forest Botanist, visited Mt. Kenya as a member of a small expedition organised by the Oxford University Exploration Club (Oxford University Mt. Kenya Expedition) undertaking scientific work on the Mountain, between June and October. He made studies of vegetation problems and collected a considerable amount of botanical material. Mr. A. C. Hoyle, Curator of the Forest Herbarium was also in East Africa touring with Mr. C. G. T. Morison and others. He is paying special attention to the remaining problems connected with the genus *Brachystegia* which it is hoped will enable him to complete a publication on this genus.

After the close of the year, the Professor attended the III World Forestry Congress at Helsingfors, where he gave the opening address in the Biology and Technique of Afforestation section.

Research Field Station. Research work on ecological problems, notably those presented by the extensive moorland afforestation now being carried out by the Forestry Commission, continues satisfactorily. Fuller particulars are given later in this report.

Scientific Societies. Various members of the staff took part in meetings of scientific societies concerned with their field of work and contacts with forestry practice were maintained by service on special Committees. The Professor was Chairman of Section K* of the British Association Meeting held in Newcastle, and gave an address entitled 'The future of our new forests.' Dr. L. Leyton also gave an address at this meeting entitled 'Fundamental Problems in the Afforestation of Moorlands.' The Professor is on the Council of the British Ecological Society and Dr. L. Chalk on those of the International Union of Wood Anatomists and the Society of Foresters of Great Britain. Colonel A. H. Lloyd serves on the Technical Sub-Committee of the British Wood Preserving Association, and on the Executive Committee of the Royal English Forestry Society. Mr. J. J. MacGregor is secretary of the Costings Committee of the Royal Forestry Society of England and Wales. The Professor is Vice-Chairman of the Empire Forestry Association and Colonel Lloyd is on its Council.

Government Committees. The Professor continues to serve on the Forestry Commission Research and Advisory Committee, and on the Committee for Colonial Agricultural, Animal Health and Forestry Research Committee. Mr. N. V. Brasnett is on the Committee on Forestry of the Colonial Advisory Council of Agriculture, Animal Health and Forestry. Colonel A. H. Lloyd is on the Eastern

Advisory Committee (Forestry Commission) and the Forest Products Research Board (Department of Scientific and Industrial Research).

Shows. Exhibits were shown at the Bath and West Agricultural Show at Bristol in June, and at the Oxfordshire Agricultural Show in May. An exhibit was staged at the British Association Meeting in Newcastle, and another exhibit was shown at the Association of Scientific Workers' Meeting in September. Smaller exhibits were prepared by Dr. Chrystal for exhibition by the Forestry Commission at other shows throughout the country.

Buildings. Hopes that the new building would be approaching completion by the end of the year did not materialise and it is evident that the earliest possible date will be the summer of 1950, though it may be possible to occupy a part, notably the top storey which is mainly designed for research work, at the end of 1949. Most of the flooring has been laid, and the services fitted and a good deal of the timber has been fashioned but not yet erected. Dr. Chalk and Dr. Handley have again devoted much time to settling details of furnishing and equipment.

Technical Assistants. There have been minor changes connected with the call up of juniors for National Service. Unfortunately, the assistant appointed last year to the Forest Botany Section is about to leave at his own request, and a new one will have to be found and trained to make preliminary identifications of tropical herbarium material. The work of Mr. F. H. Jones as Head Laboratory Assistant has effected various economies and been efficient and helpful to the smooth working of the Department. The work of the technical assistants generally has been good whilst that of Messrs. Barrett and Dexter merits special mention.

Secretarial Staff. There have been no important changes during the year, during which the staff have carried out efficiently a heavy programme of work. The high number of students, and the arrangements for their tours have imposed an extra burden.

Assistance from other Departments. There have been changes in two Readerships on which the Institute has been dependent for important parts of its programme, viz., Surveying and Soil Science. Mr. Chilton has been succeeded by Brigadier G. Bomford as Reader in Surveying, Mr. Robbins continuing as University Lecturer in Surveying. The Department of Surveying has not only continued the normal courses in Elementary Surveying of all undergradate forestry students, but also given valued instruction and instrumental facilities in aerial photographic studies.

The Institute will miss the long continued help Mr. C. G. T. Morison has given in tropical soil science. His successor, Dr. E. W. Russell, is undertaking the teaching of soil science to forestry students on a new syllabus arrived at after considerable discussion.

Mr. Masefield of the Department of Agriculture has offered to give a short course on Tropical Agriculture for Colonial Service candidates and others which will be a most useful supplement to their forestry courses.

WYTHAM WOODS

Dr. Anderson completed the field work for the Working Plan and drafted a plan in the form suggested for Dedicated Woodlands under the national proposals for privately owned forests. The work included the preparation of a very detailed stockmapping of the woods. The plans have deviated appreciably from earlier proposals particularly in abandoning the idea of having a separate coniferous circle; apart from the existing small plantations, the whole area will be retained under broadleaved trees, conifers being introduced only as nurses to the hardwoods, or as small groups in the latter. The draft will now be submitted to the University with a recommendation for its formal adoption.

Arrangements were finally agreed with the Biological Departments of the University for the demarcation, mapping and exclusion from normal forest management of specified areas totalling 95.50 acres for scientific studies. The Chalet continued to be used as a field laboratory by the interested Departments, particularly that of Zoological Field Studies. The forester, Mr. H. Probitts, is again commended for the good work carried out by him and his woodmen under the supervision of Colonel Lloyd; he unfortunately had a fall whilst climbing a tree for specimens and was incapacitated for three weeks, but he has now made a good recovery.

During the season, 20.7 acres have been planted mainly to ash, oak, beech and chestnut with coniferous nurses of larch and cypress. Most of the arable land has now been dealt with and in future heavy work in clearing the ground for planting and keeping it weeded must be expected. A number of dead or nearly dead trees were sold and extracted, making some contribution towards meeting the costs of maintenance.

All those responsible for work in Wytham have devoted much of their own time to working in the woods, and owing to a considerable extent to this, good progress can be reported in various directions.

BAGLEY WOOD

The acquisition of Wytham Woods has in no way reduced the value to the Department of Bagley Wood for instructional purposes and it has been used as much as ever this year. This is mainly due to the fact that Bagley Wood has had an active programme of woodland improvement for over forty years now, and contains crops of trees of many species up to that age. The Department is much indebted to St. John's College for the continuation of the grant of facilities from which it has benefited so long, and would also like to express its thanks in this connexion to the late Bursar, Mr. Hart Synnot, who has recently retired. Dr. Anderson has begun the field work which will lead to the preparation of a Working Plan for the wood in a form suitable for the authorities concerned with 'dedication,' which step the College has expressed its readiness to consider.

SILVICULTURE

Dr. E. W. Jones continued in charge of the Section. Teaching duties were so heavy as to prevent much research work being done, but some progress has been made in the study of the material obtained on the 1948 Nigerian expedition. During the Easter Vacation, after conducting an instructional tour, Dr. Jones made a short study tour in the Mediterranean districts of France.

ECOLOGY

The ecological examination of heathland in the north-east Yorkshire moors is still the main occupation of Mr. G. W. Dimbleby. Detailed attention has been paid to nutrient uptake by birch roots in different rooting layers in relation to the water-supplying power of the soil. This work is still in progress.

An attempt has been made to elucidate the history of these moors. There is no doubt that complex changes have taken place on the area studied which are masked by the present apparently uniform aspect, and it seems likely that these changes will influence subsequent soil changes and tree growth to an extent which would be inexplicable were the history not known. It is not to be expected, however, that anything approaching a complete historical picture will be attained, since records of the area are few, and the natural records in the form of soil and vegetation indications have largely been destroyed by extensive ploughing and planting, part of a programme which will soon have covered the whole area. In view of this, several ecological reserves have been made by the Forestry Commission to preserve some of the more valuable natural sites, in the realisation that the information they may give is likely to be of fundamental value, and therefore of interest wherever such heathland is met with.

The birch-litter experiment mentioned in last year's report as being projected is now set up and is already producing indications of interesting changes under certain combinations of treatments, though it is much too early to carry out any assessment. A second experiment has also been completed during the year designed to investigate the possible value of rotting wood (sawdust) in the establishment of birch on unploughed land. This is the outcome of ecological observations on the association of birch roots with old tree stumps, which in some way markedly stimulates growth.

Dr. E. W. Jones visited the ecological reserve in Lady Park Wood (part of High Meadow Woods) in the Wye Valley and made further progress in recording the present condition of the wood.

Tree Physiology. Dr. L. Leyton continues in charge of the Section. Information is still being accumulated as to the mineral nutrient content of forest trees and nursery seedlings on various soil types, with the object of determining whether mineral deficiencies and toxicities occur that are related to soil conditions. Thus analysis of the needles of poorly growing Sitka spruce seedlings from one nursery suggested a marked

deficiency of potassium and this conclusion is being tested by manurial trials. In mature coniferous trees (Sitka and Norway spruces) the variation in the composition of the needles with age and location in the crown has been studied and the results suggest that for the successful application of this technique to comparative studies strict attention must be paid to the sampling procedure, especially with regard to the age of the needles. Various analytical techniques are being tested with the view to establishing a satisfactory routine procedure for these investigations (cf. references to flame photometer).

Detailed investigations have been begun into problems associated with the afforestation of *Calluna* dominated moorlands and heaths. Preliminary investigations have suggested that the checking and etiolation of Sitka spruce planted on such areas may be due to manganese deficiencies arising out of intense *Calluna* competition in the rooting horizon. Experimental plots have been laid out at Wykeham (Yorkshire) and Corshalloch (N.E. Scotland) to determine the effects of increasing applications of a phosphatic fertiliser (ground mineral phosphate) and the removal of the *Calluna* cover, on the growth and mineral nutrient content of Sitka spruce growing in mixture with Corsican pine (Yorkshire) and Scots pine (Scotland).

With the help of students in the Department, investigations are continuing into the determination of the availability of mineral nutrients to tree species through nutritional studies on naturally occurring vegetation. It has been established that in oak-*Mercurialis* associations on a number of soil types, the lime and phosphorus contents of the foliage of oak and *Mercurialis* are highly correlated. Similar investigations are now being made on heathland communities in relation to the growth of Scots pine.

In collaboration with the Department of Agriculture and the Forestry Commission Research Branch, preliminary experiments have been made on the effect of various selective herbicides on the pre- and post-emergent stages of various tree seedlings. It has been found that certain compounds, in particular oils of the petroleum series, show promise for the control of weeds in coniferous nurseries.

Microbiology. Dr. W. R. C. Handley has continued in charge of the Section.

During the past year attention has continued to be focussed on various aspects of raw humus formation. Studies are now in progress which aim at elucidating the train of events which, during the death of the leaf and decomposition of litter, lead in some cases to the accumulation of the litter or its decomposition products as raw humus, and in other cases to the formation of mild humus or mull. Histological and biochemical as well as microbiological methods are being used in the investigation of these problems. It is hoped that the findings will lead to an understanding of the mechanism of the reversible mull/mor system under various conditions and ability to control it. These studies are thus directly connected with the

ecological investigations concerning the formation and maintenance of mull forest soils and in particular with the effect of birch litter on accumulated raw humus and the prevention of raw humus accumulation.

Studies on the physiology of infection of tree roots by mycorrhizal fungi are for the present in abeyance in the continued absence of glass-house facilities.

SOIL SCIENCE

The usual courses were given by Dr. E. W. Russell, Mr. C. G. T. Morison and Mr. G. R. Clarke of the Soil Science Laboratory and with the assistance in field application by the Institute Staff.

Physico-chemical Properties of Forest Soils. During 1948 research has been continued by Mr. P. J. Rennie in the Allerston Forest area. A considerable number of soil profiles from Hackness Moor were examined and a more detailed sampling programme of the moorland was carried out as a result of the initial trial.

Analytical work has progressed, though with the limited facilities available much remains to be done. In view of the unsatisfactory nature of many of the published analytical methods, modifications have been made to micro-chemical procedures for estimating nitrogen, phosphorus, potassium, calcium and magnesium so as to render them acceptable for application to soil extracts.

The need for reliable soil moisture determinations became apparent from the earlier survey and a procedure was found which gives acceptable quantitative data for the pore space of the soil in the undisturbed field condition. The volumetric proportions of water and air in the pore space have been measured and the method has been applied to moorland, afforested and recently ploughed sites. Dr. E. W. Russell has given much help in dealing with these problems.

A quantitative survey of the natural vegetation on a 4-acre experimental site was made by a multiple transect technique. Investigation of the physical factors of the soil under the different vegetation types showed significant differences.

A four-acre experiment designed to differentiate the effects of cultivation, tree growth, and natural vegetation cover was laid down with the assistance of Mr. Weatherell on Hackness Moor. Interesting differences in tree response have already been observed.

Soil Faunal Investigations. During the period under review Mr. P. W. Murphy completed the initial intensive sampling of the experimental area at Broxa. The samples were extracted with batteries of split funnels constructed last year. The main object of this survey was to ascertain the faunal status of the site in its undisturbed condition. At the same time it is hoped that this material will provide information on the number of samples required from a particular habitat in order to gain a statistically accurate assessment of the faunal population. In addition samples have been obtained

from planted sites in order to ascertain changes in faunal population after cultivation and planting. Mr. Murphy is at present engaged in the identification and assessment of these samples.

The other major project was the commencement of more intensive investigation of the funnel method of extraction. As this is the only feasible method available for extraction of samples with such high organic matter content and as it is well known that some Arthropod members are not driven out, it was considered highly desirable to obtain information on the efficiency of the method and the mechanism involved in the enforced exodus of soil organisms. With these objects in mind a new apparatus utilising the desiccation principle of soil extraction has been designed and constructed, and with it, it will be possible to treat samples under closely controlled conditions, follow moisture and temperature changes taking place during the desiccating process and ascertain the optimum conditions for extraction.

In addition an exhibit was staged at the Annual Meeting of the British Association for the Advancement of Science at Newcastle-on-Tyne. This consisted of a battery of sample extractors of the split funnel type as used in routine sampling, and also photomicrographs and slides of organisms obtained from samples.

FOREST BOTANY

The Curator of the Forest Herbarium, Mr. A. C. Hoyle, continued to teach and demonstrate in Systematic Botany and Tropical Ecology to Forestry students. His taxonomic study of the genus *Brachystegia* is nearing completion, and specimens borrowed from other Herbaria, principally that of the British Museum, have been returned. In May 1949 he left Oxford for his third visit to Africa, for a period of eight months. In N. Rhodesia and Tanganyika he will study *Brachystegia* in the field, and there, and in Uganda, he, and Mr. C. G. T. Morison, Dr. J. F. Hope-Simpson, and Mrs. B. I. Wright will continue their researches on soils and vegetation.

Mr. F. White, who succeeded Mr. J. P. M. Brenan as Forest Botanist at the end of last year, continued the determination of specimens sent to the Institute from Colonial Forest Departments. Nearly a thousand specimens were determined from the Gold Coast, Nigeria, Sierra Leone, S. Rhodesia, Tanganyika and Uganda. Species of the genera *Cissus, Croton,* and *Maba* have been the subject of special investigations.

In June, Mr. White accompanied the Oxford University Exploration Club's Mt. Kenya Expedition as Forest Botanist, and worked for three months in the Camphor (*Ocotea usambarensis*), Cedar (*Juniperus procera*), and the Podocarpus (*P. milanjianus*) forests flanking the southern and eastern slopes of the mountain. Four hundred species were collected, and an investigation was carried out on the natural

regeneration of several of the commercially important trees. Part of a set of aerial photographs of the mountain were interpreted in collaboration with Mr. K. Sargent of the Kenya Forest Department. This work was greatly facilitated by the generous co-operation of the Conservator of Forests and members of his staff.

The work of Mr. A. Corney, the Herbarium Assistant, has been lightened by the appointment of a junior assistant. This has left him more time to work on preliminary determinations than was formerly possible.

This year 2,760 specimens have been added to the Herbarium, including a valuable contribution of 2,104 duplicates from the Museum National d'Histoire Naturelle, Paris, many from West Tropical Africa. Specimens mounted during the year number 3,112.

As in previous years, a number of forest officers at home on leave have worked in the Herbarium in co-operation with members of the staff. These have included Mr. H. C. Dawkins from Uganda, Mr. R. W. J. Keay from Nigeria and Mr. R. G. Miller from Northern Rhodesia.

FOREST PATHOLOGY

Mr. W. R. Day continued in charge of the Section with Mr. F. H. Jones as senior assistant and Mr. D. Barrett and Miss D. Twist as junior assistants. Much of Mr. Jones's time was, however, taken up by his work as head laboratory assistant, and Miss Twist was absent through illness for a considerable period during the year.

Teaching. The usual courses of instruction on Forest Hygiene and Pathology for the final schools were given. A special course of lectures for Indian and African forest officers was also given.

Research Students. Mr. Sahni continued his work on the Larch Canker fungus during the year and successfully submitted his thesis for examination for the degree of B.Sc. at the end of Trinity Term.

Mr. M. I. Khan has been working in the Pathology laboratory (as the Institute has no Forest Genetics Section) on the chromosome structure of certain species and hybrids in *Acacia* and *Larix*.

Research. (1) *Root disease and butt-rot of Conifers.* In collaboration with Mr. T. R. Peace, Pathologist to the Forestry Commission, the investigation was begun of two cases of serious, although restricted, dying of Sitka spruce of about twenty-two years of age in the Forest of Dean. No fungus known to be a parasite of roots was discovered but the examination of root systems of still living trees showed that very extensive dying-back of the root had occurred. Zones of abnormal tissue of the type already recorded occurred in the still living parts of roots which had died back, suggesting that physical causes had probably been of importance as causes of disease. There can be hardly any doubt that had a fungus such as *Fomes annosus* been present in the areas investigated, this local dying of Sitka spruce would have presented itself as an instance of severe fungus infection. Further work on this problem is projected.

Local patches of dying conifers which have reached an age of about twenty to twenty-five years continue to be reported and are being examined, either by Mr. Peace or Mr. Day. There have been some new cases recently in western Scotland. In some cases, for example, those which occurred on wet peat soils in which the rooting of Sitka spruce is shallow, although the rate of growth in height may be fast, at least during early years, the fundamental causes of disease seem clearly to lie in the shallow permanent rooting depth and the very adverse conditions of the wet subsoil.

Another aspect of this problem was seen in the dying back of eight-year-old Japanese larch on shallow stony soils on a steep hillside in South Wales. Here there was clear evidence that the drought of 1947 was the cause of trouble; local susceptibility to disease was correlated with depth of soil and drainage conditions.

The effects of root disease arising from physical factors which are natural to a site may plainly be many. One of its results is seen in susceptibility to wind-throw. The opportunity has occurred on many occasions to examine the root systems of wind-thrown trees and this year, in a tour in Scotland, special attention was paid in a number of localities to this problem from the point of view of the health of the root-system. There is a great deal of evidence that liability for wind-throw to occur depends largely on the shallowness of rooting over a subsoil which is markedly unfavourable for root growth. Such soils frequently permit good rate of growth in young trees and it may not be realised that there is, all the time, an inevitable source of root disease in the subsoil conditions, that this will equally inevitably weaken the anchorage of the tree and that, unless appropriate silvicultural measures are taken, the risk of extensive wind-throw may become high.

(2) *The Drought-crack of Conifers.* Cracked specimens of Sitka spruce from Radnor Forest in Wales were referred to the Institute for examination. Subsequent enquiry and report showed that this cracking had occurred over a very wide area in Wales and in parts of both the east and west of Scotland. An examination of the anatomy of the affected trees showed that the cracking had occurred during the growing season in 1947 and drought was suggested as being the probable cause: subsequent investigation has confirmed this view. Sitka and Norway spruce have been the most seriously affected by drought-crack; but all the conifers commonly grown, the pines excepted, have been affected to some degree. This same phenomenon has also been reported from Denmark on spruce.

Drought-crack results from the internal shrinkage or collapse of the wood, owing to water being withdrawn from the main stem during periods of drought. It has only been seen in trees of about twenty years of age; younger trees affected by drought seem always to die-back without the cracking of the main stem. Drought which is sufficiently severe to cause the collapse and cracking of the wood of pole-size trees, or the dying back of younger trees, also causes a

more or less pronounced zone of abnormal wood to appear in the main stem; the character of this zone is similar whether the tree dies back, or cracks without dying back.

There are two further points of interest in connection with this phenomenon. Firstly, the affected spruces have been distinguished by the low specific gravity of the wood produced and the marked absence of well-thickened late-wood. The tendency in spruce to produce this light consistently thin-walled wood was noted in the report for last year in connection with the bark-necrosis of conifers attributed to frost injury. It is suggested that wood of this type favours collapse within the main stem owing to the strains set up during dry periods. A still further reason is here to be found for a search for strains of spruce which will produce a more normal type of wood under the conditions of growth in this country.

All the cases of drought-crack which have been examined in the field so far, have occurred on soils which are reasonably fertile, and so encourage good growth in the young tree, but which are shallow in so far as root development is concerned. The shallowness may be temporary or permanent. It is temporary, for example, on some freely draining soils, the subsoil of which consists almost entirely of stones, often of small size. These freely draining stony subsoils can supply enough water during average or wet seasons, but not during dry seasons. The shallowness is permanent when a compact ill-drained subsoil occurs beneath the shallow fertile top-soil. These types refer, of course, to extremes which are inter-connected by sub-soils of mixed character. In any case the fundamental defect is the limited character of the soil water reservoir.

It was pointed out above in connection with root disease that the defective character of the subsoil was a matter of fundamental importance. Drought-crack is in reality a secondary phenomenon which occurs, under appropriate climatic conditions and at an appropriate age, in trees which grow where the rooting-space is unduly limited considering the potential needs of the tree and the fluctuations in water and air capacity to which the rootable soil is subject as the type of season varies. Preliminary observations in the field seem to indicate clearly that partial death of the root-system occurs consistently in connection with drought-crack, although in some cases probably only the finer roots are affected.

(3) *The silviculture of European larch.* The work on the proposed publication on the silviculture and pathology of European larch is proceeding. It has, unfortunately, been delayed, partly by illness and partly by the need to attend to other work in progress at the same time. The opportunity was taken, during the tour in Scotand in July 1949, to study the natural regeneration of larch and also the soil conditions under which this tree grows to a considerable size and age.

(4) *Bark necrosis and canker of the mainstem of conifers in the pole stage.* The work reported on last year, concerned with this

phenomenon on spruce, has been written up and will appear as a Forestry Commission publication. Further work on this matter has been delayed, largely owing to the need to investigate the drought-crack of conifers reported on above. It is hoped during the coming year to complete the anatomical work on Japanese larch affected by this disease.

Observation in the field has shown that this necrosis and canker is widespread, though not usually serious. It has, for example, been seen during the year in the Forest of Dean and in western Wiltshire on Norway spruce, on Loch Fyne-side on Sitka spruce, and in the Lake District and Breconshire on Japanese larch. A close examination of plantations in the pole stage often reveals that a few trees are affected. It is only locally that severe injury has occurred on a large number of trees.

(5) *The fungus flora of spruce stems.* It was reported last year that Mr. Hasan had discovered in Sitka spruce examined by him that the main stems which were living and showed no injury above ground were occupied by a number of fungi. Borings taken in living and outwardly uninjured Sitka spruce during the investigation of root disease referred to above, showed that they also were colonised by various species of fungi. These trees varied from about six to nine inches in diameter: borings taken in Sitka spruce of this size in other places have shown that such stems need not have fungus flora. This colonisation of spruce stems seems to be made possible by debility caused by root disease of the type that has already been considered.

It was thought desirable to see if the wood of the Drummond Hill Norway spruce affected by bark-necrosis was colonised by fungi. A large number of borings was made in the stems of these trees by Mr. F. Farquhar of the Forestry Commission, by arrangement with Mr. J. A. B. Macdonald, and it was found that they were all colonised by fungi, not all of which are likely to be active in the rotting of wood. Even the control trees in this pruning experiment were colonised, although the species of fungi seem to be different in these unpruned trees from those which occur in those which have been pruned.

Isolations have also been made from the wood of drought-cracked spruce and again a number of species of fungi were obtained.

The discovery that spruce may bear a fungus flora in their wood, even when they appear to be healthy as judged by the appearance of the crown, is a matter of very considerable importance in view of the extensive use of spruces, especially Sitka spruce, in afforestation in this country.

(6) *Other items.* Some plantations of Sitka spruce, of from twelve to twenty-five years of age, have been examined which suggest the possibility of a serious decline in health. In the limited cases examined defoliation by the green spruce aphis and by frost appear as the immediate causes of the poor appearance, but it is

highly probable that soil conditions, such as some of the rooting conditions discussed above, are of fundamental importance. This debility of spruce is a matter which should receive attention in view of the expectations placed on this species as a future producer of timber in this country.

Some very interesting discussions have been held during tours on the problem raised by the utilisation for forestry of the shallow soils which are so characteristic of much of the land available for forestry in Britain. In certain aspects these soils tend to be pathogenic in character, as some of the matters discussed above show. There is a very great need at the present time for a review, aided by field investigation of the plantations now growing up, of the essential characteristics of these soils and of the biological and economic consequences. There appears to be no adequate appreciation of these problems among the foresters concerned.

Thanks are due to numerous members of the Forestry Commission for help and advice in arranging tours and assistance in carrying them out. Thanks are also due to members of the Forest Products Research Laboratory for help in the identification of fungi and also in preliminary researches concerned with the wood of trees affected by bark-necrosis and drought-crack. Acknowledgment of helpful and responsible work on the part of the assistants has to be made. Mr. Barrett's work in connection with bark-necrosis and drought-crack of conifers merits special mention.

FOREST ENTOMOLOGY

Dr. R. N. Chrystal continued in charge of the Section with Mr. E. R. Skinner as his assistant.

Teaching. Courses of instruction in forest zoology were given during Hilary and Trinity Terms, together with field demonstrations. Instruction in forest entomology was continued at the Forestry Commission's forester training schools at Parkend, Forest of Dean, Lynford Hall, Norfolk, and Capel Curig, North Wales.

Research. (1) *Douglas fir Adelges.* The *Adelges* population in the areas under observation at Tubney, Berks, and in the Coed-y-Brenin forest, North Wales, generally showed an increase over that of the previous two years. In the North Wales areas there was one noticeable change in the distribution of the *sistens* population. This was found, in certain cases, to be more heavily distributed on the outer and more exposed parts of the trees, a condition which was probably due to the mild winter and absence of heavy rain and snow, which normally cause a high mortality rate among the population in such portions of the trees.

Comparative studies were made in the pruned and unpruned strips of two young plantations at Ffrid Goch, Coed-y-Brenin forest, North Wales. The vigour and growth of the pruned areas continued to compare well with that of the unpruned trees, and the *Adelges*

population in the pruned trees has shown no tendency to build up its numbers in the higher levels of the foliage. Sampling assessments of the stem-mother population were made during May with the object of comparing the difference between conditions in pruned and unpruned trees. For this purpose, comparisons were made of the difference in population density in the lower branches of unpruned trees up to, and above the 6-foot level, with that in the higher branches of pruned trees, above the 6-foot level. Sampling involved the examination of 100 trees in each area strip, and selection of branches representative of the general condition. From each branch, four comparable samples were selected and a detailed needle and *Adelges* count made. An overall comparison between the pruned and unpruned areas showed that the *sistens* population was nearly three times as dense on the unpruned trees.

A reassessment of the original Douglas fir plantation at Tubney Wood has been started, and will be concluded this winter. It is estimated that about 40 per cent. of the original trees remain after losses from thinning (1949) and other causes. Information will be compiled from this plantation showing the height and girth growth of the remaining trees, the 'case-history' of which is known from 1942-43 to 1949. From these data it may be possible to ascertain whether there is any correlation between heavy attack during any one season or seasons and significant growth reduction. Attention is also being given to those trees which have shown apparent resistance to *Adelges* attack from the beginning.

(2) *The Alder Woodwasp. Xiphydria camelus L.* The study of this species was originally begun by students of the Lynford Hall Foresters' School, during 1948. The discovery of a parasite complex involving two rare species, in addition to a common Ichneumonid, *Rhyssella curvipes* Grav., the biology of which was already known, necessitated the extension of the investigation. Work is being carried out in Oxford in consultation with the British Museum authorities. Specimens of both the rare parasites were submitted to the British Museum. One was determined as *Aulacus striatus* Jurine, (Hymenoptera Aulacidae), the biology of which was practically unknown. A series of this parasite is being deposited in the British Museum National Collection. The second parasite was believed to be a species of *Pteromalus* (Hym. Chalcidoidea). Detailed study now suggests the possibility of its being placed in a new genus. A long series for study and comparison has accordingly been sent to the British Museum. In addition to being probably new to Britain, the species exhibits a parasitic habit which has not previously been recorded. A paper on the biology of the woodwasp and its parasites is in course of preparation.

(3) *Other items.* Exhibitions were staged at the Oxford County Agricultural Show in May, and in conjunction with the Forestry Commission a large exhibit was staged at the Bath and West Show at Bristol in June. Smaller exhibits were prepared for exhibition by

the Forestry Commission at other shows throughout the country. A special exhibit of *Adelges* was shown at the British Association meeting at Newcastle in September.

At the request of the New Zealand Department of Forestry, arrangements were made for the printing of a copy of the full-length version of the *Sirex* woodwasp film.

MANAGEMENT

The usual courses of lectures were given by Mr. N. V. Brasnett to the junior and senior years in the Hilary and Trinity Terms. That on the historical development of forest management in western Europe was also attended by the African Forest Officers. Four talks on Colonial Forest Management were given to the Colonial Forest Officers and Probationers. Dr. M. L. Anderson gave short courses on selected points in management with reference to British conditions.

The senior students completed the field work of their working plans in High Meadow Woods in the Wye Valley. These students are encouraged to find their own solutions of the management problems presented by the area for which they have to prepare a working plan. The plans submitted this year for a part of the High Meadow Woods (about 500 acres) were an interestingly varied collection of solutions. Systems of management ranged from orthodox uniform with periodic blocks, to very elastic group selection. Some students prescribed one working circle only with individual stand management, and others divided the area into several circles, sometimes including an amenity circle and sometimes providing for the amenities to be preserved by their general system of management. The resultant plans were satisfactory at least in that almost every one showed that the writer had to the best of his ability applied the knowledge he had acquired in his various courses on soil science, ecology, silviculture, economics, utilisation, mensuration, and management, and had thought out a reasonable solution for himself with such guidance as he felt disposed to seek.

The junior year will only begin work on their plans in September, 1949, as it has been decided to move to the New Forest for this purpose, use being made of the facilities offered by the Forestry Commission at Northerwood House. It has also been decided that it is preferable to have a shorter interval between the two parts of the work.

Management problems have been discussed with several senior officers of Colonial Forest Departments visiting the Institute when on leave. There has also been a good deal of correspondence with these and other officers, and during the year several draft working plans were received, sent either by the authors, or by Heads of Forest Departments, for information and comments. It is hoped that this practice will increase, both because of its value in keeping the Institute

abreast of current problems and management work in the several Colonies, and because the Institute may sometimes be able to supply information to officers who are not in a position to discuss their problems with others of wide experience of management under working plans. Suggestions made in this way can be accepted, modified or rejected in light of local circumstances. Among the matters referred to the Section during the year was the format of a standard working plan which was being adopted in one of the Colonies, a draft manual for use in a training school for foresters, and methods of yield regulation in tropical high forest.

MENSURATION

Teaching. The usual courses in mensuration with practical work in Bagley Wood were run for the junior year by Dr. M. L. Anderson.

The senior year's practical work included the re-establishment of a permanent plot of Corsican pine and remeasurement of a sample plot of Norway spruce in Bagley Wood. Twelve lectures on selected points in Forest Mensuration, including enumeration methods, were given to advanced students.

Aerial Survey. Mr. A. R. Robbins, of the Survey Department, and Mr. G. W. Dimbleby again gave a joint course in aerial photography and its forestry applications to the advanced students. This course was an extended version of the one given last year, in consequence of suggestions put forward by the students attending the latter.

STATISTICAL SECTION

Mr. M. R. Sampford gave a course of lectures on Elementary Statistics for Forestry Students and Mr. D. J. Finney's lectures were available for the more advanced students.

Miss J. Smith continued to act as computor, under the supervision of Mr. Day. One new hand-operated calculating machine was obtained during the year. The acquisition of a second electrically operated machine has been delayed.

Work in this section has proceeded satisfactorily. There has been a small decline in the demands on the computor on the part of the staff during the year; but those from research students have increased. The three hand-operated machines have all been in demand in addition to the electrically operated one. There is an increasing tendency for both undergraduate and research students to use statistical methods in the examination of data. There is still, however, a tendency for statistical techniques to be used uncritically. The advice and helpful criticism received from the Lecturer in the Design and Analysis of Scientific Experiment and his staff is gratefully acknowledged.

WOOD STRUCTURE

Dr. L. Chalk continued in charge of the Section with Mr. A. A. Shaw as senior assistant.

Teaching. The usual undergraduate and post-graduate courses were organised, and again large numbers made it necessary to repeat most laboratory classes.

Research. The book on systematic anatomy, written in collaboration with Dr. C. R. Metcalfe of the Royal Botanic Gardens, Kew, was completed and handed in to the Press early in the year. Further progress, however, has been much delayed for technical reasons during the final proof stage and it will be some time yet before the book is actually published.

A very large amount of data on the microscopic anatomy of wood was accumulated during the writing of the book and a start has been made with the analysis of this for other primary descriptive purposes. These data are gradually being transferred to punched cards and about 750 new cards were completed during the year.

Relatively few additions to the wood collection were made during the year; the principal donors were the Forest Products Research Laboratory, Princes Risborough, and the Forest Department, Jamaica (through Mr. L. V. Burns). The larger numbers in the practical classes made necessary greatly increased teaching sets of specimens, photomicrographs, punch card keys, etc.

Dr. Chalk has been responsible for dealing with the receipt and use of all the gifts of timber from the Empire for the new building, and for all the furniture, as well as the floors, doors and panelling, etc., into which these gifts are being converted. This has occupied a large amount of time.

FOREST ECONOMICS, ETC.

Teaching. Courses of lectures and tutorials were provided by Mr. J. J. MacGregor on forest economics following a course on general economic theory to the senior year students and Colonial Probationary Officers. Courses were also provided by him on ' British Forest Law, Land Tenure and Taxation ' for final year students, and in current forest economics for Indian Graduate students. To meet the special needs of the Colonial Probationary Officers, a method of combining the study group and seminar was evolved with the idea of enabling the Officers to put the main economic problems of their colonies in perspective.

Mr. MacGregor accompanied Dr. Jones on the tour for first year students to the forests of the Landes and Normandy during the Easter Vacation.

Research. The economic history of the woodlands on three private estates has been published as an Institute Paper.

The general reaction of estate owners and their agents to the interim report of the Costings Committee of the Royal Forestry

Society of England and Wales on which Mr. MacGregor has acted as secretary, is that the method proposed may require too much work for the average estate. Consequently, an attempt is now being made to simplify the procedure without destroying the essential aims for costings. Analyses of forestry income and expenditure on a few estates were prepared during the year.

Research was made on timber supplies and prices in Britain and two articles on these subjects were published. Research was also begun on the economic aspects of Britain's forest policy in the present century.

The Forest Economist continued to serve on the Oxon and Bucks Divisional Committee of the Royal Forestry Society and in this capacity assisted with the forestry exhibit at the Oxfordshire Agricultural Show.

COLONIAL FOREST ADMINISTRATION

The course on this subject was given by Mr. N. V. Brasnett in the Hilary and Trinity Terms to the Colonial Officers and Probationers, and to those of the final year students who were offering it as an optional subject in their Schools.

FOREST ENGINEERING AND UTILISATION AND FOREST PROTECTION

These subjects have been dealt with by Colonel A. H. Lloyd but much of his time has been taken up in organising and conducting tours and shorter excursions, and in the practical management of Wytham Woods.

Forest Engineering. The usual lecture courses were given to Degree course students, and a special course of eight lectures to Colonial Probationers, on modern methods of timber felling, extraction, transport, sawmilling and woodworking machinery.

Field instruction was carried out in the Wytham Estate including road alignment and estimating.

Practical work in the Long Vacation was provided by arrangement with the Forestry Commission for junior year men in the New Forest and South Wales. Special thanks are due to the Conservators concerned, Mr. Rouse and Mr. Russell, for their co-operation in providing suitable tasks and also accommodation for the students at a difficult time of the year for forestry work. Arrangements were again made for two or three weeks' practical work in Norway for four students. Other students carried out practical forestry work on private estates in England and Scotland.

Utilisation. Fifteen Probationary forest officers and twenty final year students attended a course of demonstrations and lectures in kiln drying, timber mechanics, sawing and woodworking machinery, plywood manufacture and wood chemistry at the Forest Products Research Laboratory. Thanks are again due to the Director,

Dr. F. Y. Henderson and to Mr. C. W. Scott and the Laboratory staff who assisted them, for providing a very successful course, in spite of the large number of students attending.

Messrs. J. Sadd and Sons Ltd., of Maldon, Essex, kindly gave special facilities and help in the study of sawmilling and modern methods of timber extraction to an officer deputed from Tanganyika (Mr. Hughes) for a course in Utilisation. Messrs. J. Gliksten and Son also gave considerable help and advice to visiting Forest Officers and Probationers interested in conversion problems.

Tours and Excursions. Visits to sawmills and furniture factories were included in the tour for Colonial Forest Officers in Belgium referred to elsewhere, and during the senior-year student tour in Norway and Sweden, modern Scandinavian gang-saw mills, paper-pulp plants and river floating, rafting and sorting operations were visited. A useful demonstration of tree felling and the conversion of large elm timber was given by Messrs. Wright & Sons at Redditch where the students also inspected gatemaking and other small wood-using industries.

Day excursions were made to the Imperial Institute, Messrs. W. W. Howards' Sawmills, and Messrs. Burt, Boulton and Haywood's impregnation plant at Southampton. Messrs. Gliksten's sawmills at Stratford and furniture factories at High Wycombe were also visited.

SURVEYING

Mr. A. R. Robbins, University Lecturer in Surveying, gave the regular course in Surveying in the Michaelmas Term, and repeated it in Trinity Term for the benefit of ex-Service students. He also gave a joint course with Mr. Dimbleby on aerial survey as described above under *Mensuration*.

LIBRARY

The Librarian, Miss G. Guiney, reports on the year's record in the Library as follows:

Accessions. Except for books, the number of accessions was slightly lower than last year. The Brooks Fund provided 9 books; the Commonwealth Forestry Bureau gave 232 items, and 163 were acquired by request from various institutions.

Bound Volumes. The library now contains about 4,500 bound books and 3,500 bound volumes of periodicals.

Issues of periodicals	1528	(1553 in 1947/48)
Books	191	(126 ,, ,,)
Other items	1159	(1222 ,, ,,)
Total	2878	(2901 ,, ,,)

Loans:

To Staff	2832	(2482 in 1947/48)
To the Bureau	847	(905 ,, ,,)
To Students	1911	(1637 ,, ,,)
To visitors and correspondents ...	571	(731 ,, ,,)
Total	6161	(5755 ,, ,,)

The increase over last year, about 400, would have been greater, but for new arrangements which were under trial with the object of retaining recent accessions in the Library.

Visitors using the Library included persons from China, Finland, Germany, Holland, India, Canada, Sweden, Norway and the United States.

New Periodicals. Twelve titles were added, three from England, two from the U.S.A., and one each from Portugal, China, Germany, Austria, Canada and France; and one International. These additions bring the total number up to 302 of which about 200 are current.

New Series other than periodicals. Forty-two titles added, bringing the total up to 2,460 of which about 875 are current.

Miscellaneous non-serial publications. The library now contains about 25,000 pamphlets and reprints filed under subjects.

Correspondence. This continues to be considerable, involving over 1,500 issues and 1,000 receipts.

Library Sales:

Institute publications	£34 12s. 8d.
Books, etc., resold	£55 10s. 6d.
	£90 3s. 2d.

The number of publications ordered by post is rapidly increasing.

Catalogue Room. After three years' work on the arrears that had accumulated, the catalogue has finally become an up-to-date work of reference.

Except for a certain amount of respacing and the inevitable corrections and adjustment which always associate themselves with a work of this size, the past year has been mainly concerned with the incorporation of current accessions; 13,675 cards were added.

It was the Assistant-in-charge's hope that a slight reduction in work might now be looked for, but with the introduction of modifications in the classification that, after the recent international discussions, are being adopted in the new year, this hope will be deferred another year at least.

Gifts. Many benefactors enriched the Library during the year and are warmly thanked. Mention may be made particularly of

Miss Chester, El Duque de San Lucar, Spanish Embassy, London; Mr. D. W. Young, Lyndhurst; the Irwell Valley Water Board; the Reconstruction Research Group, University of Bristol; the Royal Veterinary and Agricultural College, Copenhagen; the Forestry Adviser, Colonial Office; the Chief Conservator of Forests, Madras; the Librarian, Department of Botany; Dr. J. L. Harley; Mr. D. F. Davidson, Cyprus; the Charles Lathrop Pack Foundation; Dr. Chrystal; Colonel Lloyd; Mr. Hoyle; Mr. Brasnett.

List of Periodicals. The issue of a printed list of periodicals and serial publications held in the Library from all sources marks the end of a task which has taken over two years. It was begun by Mr. Y. Smythies and after his appointment as Assistant Librarian in 1947 was continued and finished by Mrs. Smythies; to both, acknowledgment is due for their accuracy, skill and energy. Wide correspondence with many institutions, British and foreign, was necessary for the verification of obscure details and the filling of gaps. In arranging the material for printing, efforts have been made by variation of type and other devices, to produce maximum clarity and ease of reference; the unequalled experience of the Oxford University Press was gratefully drawn upon in this problem, and Mr. Beak, Miss Withycombe, and other members of the Bureau staff were most helpful with suggestions and advice. Users will be much indebted to the compilers for this most helpful work. It comprises 118 pages, and represents 103 countries, 302 periodicals (nearly 200 of these being current and expected to continue), and 2,460 separate titles of series (875 current), such as Bulletins, Reports and similar occasional material. Earliest dates established were: of periodicals, 1822 (Germany); of general reports 1852 (India); of annual reports 1849 (Bombay); of working plans, 1875 (United Provinces). The opportunity was taken to make a survey of the relevant catalogues in detail and to remove a number of non-essential series inherited from the past.

PHOTOGRAPHIC SECTION

There have been continuous heavy demands on the Section for all classes of work in connection with tours, research records, exhibits, teaching requirements, etc. Approximately 1,352 negatives have been developed, 5,083 prints, mostly enlargements, and 114 lantern slides have been made. Maintenance of the print collection to which about 400 prints have been added during the year making a total of approximately 7,500, has also been progressing steadily. Facilities have been improved by the acquisition of a rotary glazing machine and numerous other small items of equipment. Extra projection equipment has also been acquired including film strip and 16 mm. cine-film projectors, both sound and silent.

The Section also deals with the duplicating work of the Department. Forty-four Gestaprint photographic stencils and over 4,900

duplicated copies of drawings, charts, etc., have been made together with over 30,000 copies from typed stencils. The staff consists of Mr. H. F. Woodward and one assistant.

WORKSHOP

Workshop facilities have been further developed and very fully occupied. The Institute now has a full time metal worker, Mr. E. J. Howell, and a full time wood worker, Mr. J. Howkins. The work of both having been highly commendable. Further machinery has been acquired or purchased for the workshop in the new Institute which will be much more commodious and convenient and better equipped than the present make-shift arrangements.

The following pieces of apparatus have been constructed, together with many smaller items:—

Apparatus for extraction of small insects, etc., from the soil
8 Split funnel extractors for the same purpose
Heated propagating frame
Microscope slide cabinet to hold 8,800 slides
Multiscope for viewing aerial photographs
Warburg for investigation of metabolic processes
Blender for reducing materials to a finely divided state

FINANCE

The audited accounts of the Department will be published in the *Oxford University Gazette*. The following is a summary of income and expenditure for the year.

GENERAL ACCOUNT

Income. Curators of the University Chest, £250; Forestry Commission, £12,154; Colonies, £5,000; Colonial Development and Welfare Fund, £6,685; Dominions, India and others, £1,100; other receipts, £292. Total Income, £25,481. [It should be noted that in addition to the above income, the University has paid, on behalf of the Department, the sum of £8,488 on Staff Salaries and Pension Contributions, bringing the effective income up to £33,969.]

Expenditure. Staff Salaries and Pension Contributions, £17,912; Instructional Supplies, £1,949; Furniture, £222; Travelling, £1,643; Administrative and Miscellaneous Expenses, £2,573; Repayment of Interest on Capital Account, £13. Total Expenditure, £24,312. [Or £32,800 including University salaries, etc.]

APPENDIX I

PUBLICATIONS

GENERAL

Original Papers

Some Observations on Belgian Forestry, by M. L. Anderson. Empire Forestry Review, Vol. 28, pp. 117-130.

Forest Notes from Holland, by H. G. Champion. Accepted for publication in the Empire Forestry Review.

State Control of Private Forestry under European Democracies, by M. L. Anderson. Oxford Forestry Memoir 22. In the Press.

The Dedication Scheme for Private Woodlands, by J. J. MacGregor. The Journal of the Royal Agricultural Society of England, Vol. 109, pp. 222-230.

Twenty-fourth Annual Report of the Imperial Forestry Institute, 1947-48. The Committee for Forestry. Holywell Press, Oxford, 1948.

Reviews

Administration Reports: *Nyasaland Protectorate,* 1946, *Tanganyika Territory,* 1945 *and* 1946, *Uganda Protectorate,* 1947. Empire Forestry Review, Vol. 27, pp. 356-362. (*N. V. Brasnett.*)

Nyasaland Protectorate, 1947. Empire Forestry Review, Vol. 28, p. 202 (*N. V. Brasnett.*)

SILVICULTURE

Original Papers

Enrichment of Tropical Mixed Deciduous Forest by Planting, by N. V. Brasnett. Forestry Abstracts, Vol. 10/4, June, 1949, pp. 447-454.

Biology and Technique of Afforestation, by H. G. Champion. Section I. Silvics and Silviculture, of the III World Forestry Congress.

Tree Breeding and Seed Supplies in Western America, by H. G. Champion. Accepted for publication in Forestry.

Reviews

The Caucasian Silver Fir, by M. V. Gerasimov. Empire Forestry Review, Vol. 28, pp. 180-182. (*M. L. Anderson.*)

Note de Silviculture Katanguienne, by G. Delevoy. Empire Forestry Review, Vol. 28, pp. 182-184. (*N. V. Brasnett.*)

ECOLOGY

Original Papers

The Ecology of the Cairngorms, Part I, by E. W. Jones and A. S. Watt. Journ. Ecology, Vol. 36, pp. 284-304.

Fundamental Problems in the Afforestation of Moorlands, by L. Leyton. Read to British Association for the Advancement of Science Meeting, September, 1949.

Flame Photometry, by L. Leyton. Annual Report of the Chemical Society, 1948-49.

FOREST BOTANY

Original Paper

Check-lists of the Forest Trees and Shrubs of the British Empire, No. 5: Tanganyika Territory, Part II, by J. P. M. Brenan (in collaboration with P. J. Greenway).

FOREST PATHOLOGY

Original Papers

Forest Pathology in relation to Land Utilisation, by W. R. Day. Empire Forestry Review, Vol. 28, pp. 110-116.

The Relation between Soil Conditions, Type of Ground Vegetation, and the Growth of Trees, by W. R. Day. Forestry, XXII, pp. 184-193.

Unpublished Reports

Decay in Oak in the Forest of Dean. A summary of the work done by W. R. Day and T. R. Peace on this subject and incorporating data and opinions of others. (*W. R. Day.*)

On the causes of disease in one and two year old stems from the tops of Pinus radiata. [The material was collected in Mount Burr Forest, South Australia and Carr Kirrup Plantation, Western Australia.] (*W. R. Day.*)

On the dying-back of Japanese Larch in the Cum Dinbath section of Cwm Ogwr Forest. June, 1949. (*W. R. Day.*)

FOREST MANAGEMENT

Original Papers

Sustained Yield Management in Western America, by H. G. Champion. Empire Forestry Review, Vol. 28, pp. 222-225.

The Future of our New Forests, by H. G. Champion. Presidential address to Section K* of the British Association for the Advancement of Science. Will appear in Proceedings of the British Association for the Advancement of Science.

WOOD STRUCTURE

Reviews

A Manual of the Timbers of the World, by A. L. Howard. Quarterly Journal of Forestry, Vol. 43, p. 89. (*L. Chalk*).

Identification of softwoods by their microscopic structure, by E. W. J. Phillips. Empire Forestry Review, Vol. 28, p. 185. (*L. Chalk.*)

FOREST ECONOMICS

Original Papers

Some improved techniques in Nurseries and on planting sites, by J. J. MacGregor. Forestry Abstracts, Vol. 10/1, 1948, pp. 1-10.

The Forest Economy of Three Private Estates in Britain, by J. J. MacGregor. Institute Paper, No. 25, pp. 76.

Timber Supplies and Prices in Recent Years and Future Prospects, by J. J. MacGregor. Quarterly Journal of Forestry, Vol. 43, pp. 6-15.

Problems and Methods of Assuring Prices for Home-grown Timber, by J. J. MacGregor. Quarterly Journal of Forestry, Vol. 43, pp. 119-125.

Review

Valuation of Forest Lands from the Public Viewpoint, by Bernard Frank; Unasylva, Vol. II, No. 2, Mar.-Apr., 1948, pp. 55-62. In the Empire Forestry Review, Vol. 27, pp. 340-342. (*J. J. MacGregor.*)

FOREST UTILISATION AND ENGINEERING

Reviews

The Use of Timber in Mining, by H. Hanshaw. Empire Forestry Review, Vol. 28, p. 210. (*A. H. Lloyd.*)

Timber-Manufacture, Conditioning, Grading, Distribution and Use, by N. Courtlandt Brown. Quarterly Journal of Forestry, Vol. 43, pp. 29-30. (*A. H. Lloyd.*)

Transport of Wood by Gravity over Suspended Wire, by A. Koroleff and C. R. Silversides. Empire Forestry Review, Vol. 28, pp. 194-195. (*A. H. Lloyd.*)

FOREST PROTECTION

Original Paper

Fire Protection in the American West Coast Forests, by H. G. Champion. Accepted for publication by Empire Forestry Review.

LIBRARY

Original Paper

List of Periodicals, Department of Forestry. Oxford University Press, 1949.

APPENDIX II

STAFF

I. STAFF ENGAGED IN INSTRUCTION AND RESEARCH

PROFESSOR H. G. CHAMPION, C.I.E., M.A. (Oxon.). Tropical Forestry, Forest Policy.

L. CHALK, M.A., D.Phil. (Oxon.). Wood Structure and Properties.

W. R. DAY, M.A., B.Sc. (Oxon.). Pathology, Forest Hygiene.

A. H. LLOYD, O.B.E., M.C., T.D., M.A. (Oxon.). Forest Engineering and Utilisation.

R. N. CHRYSTAL, D.Sc. (Edin.), Hon. M.A. (Oxon.). Forest Zoology.

N. V. BRASNETT, M.A., Dip. For. (Cantab.). Forest Management.

M. L. ANDERSON, M.C., M.A. (Oxon.), D.Sc. (Edin.). Mensuration.

J. J. MACGREGOR, B.Sc. (Glasgow), M.S. (Wisc.), B.Litt. (Oxon). Forest Economics.

E. W. JONES, M.A. (Oxon.), Ph.D. (Cantab.). Silviculture.

W. R. C. HANDLEY, M.A. (Oxon.), Ph.D. (Leeds). Microbiology.

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